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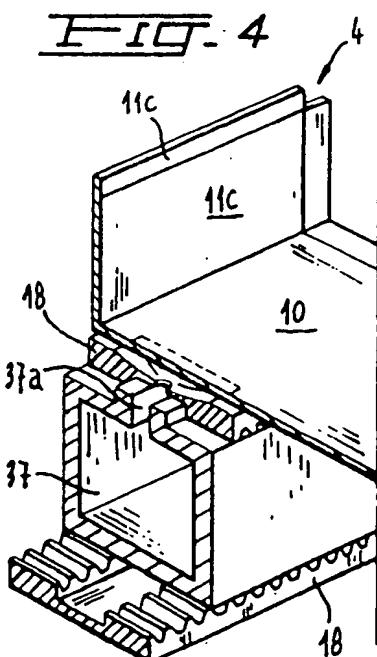
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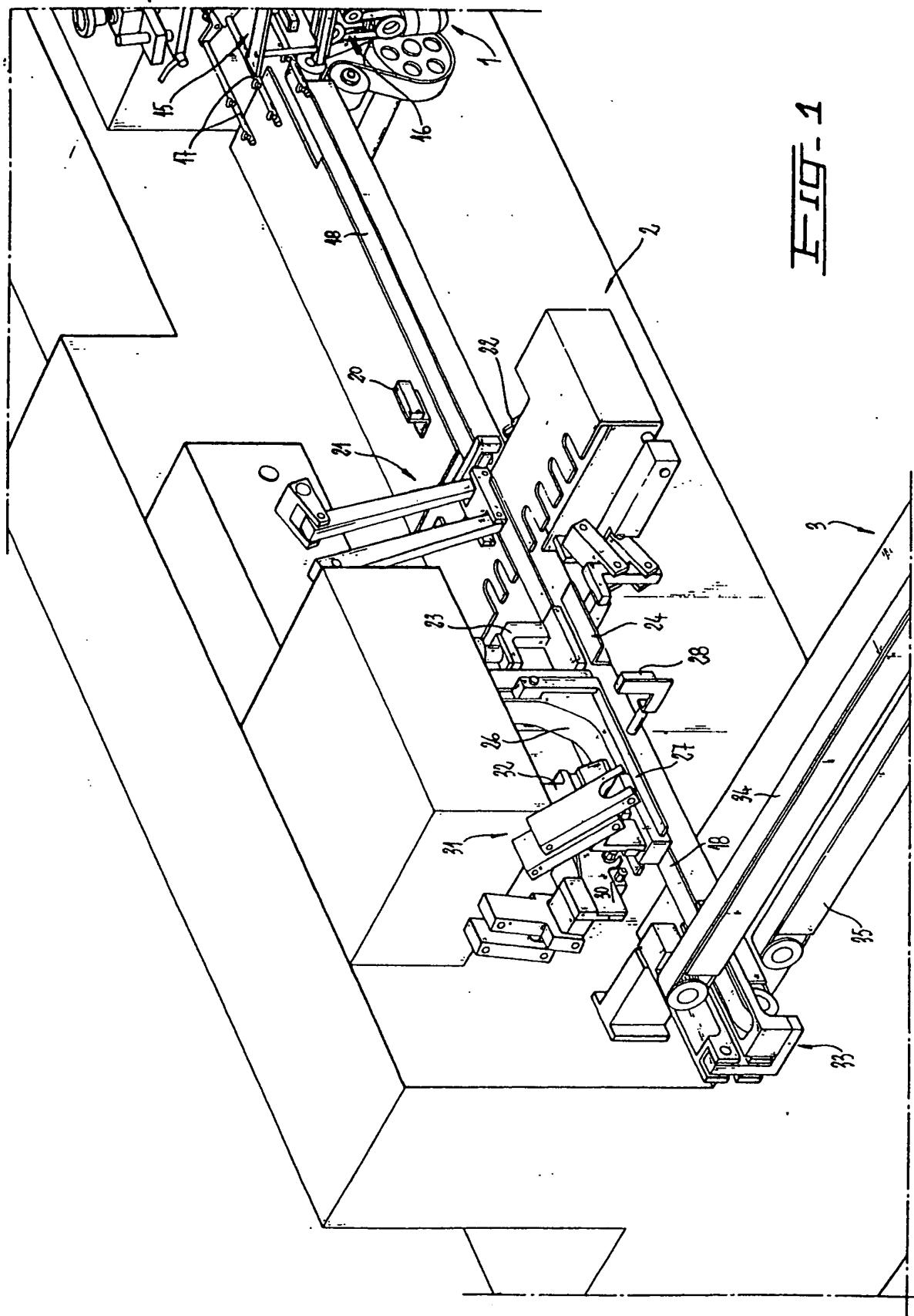
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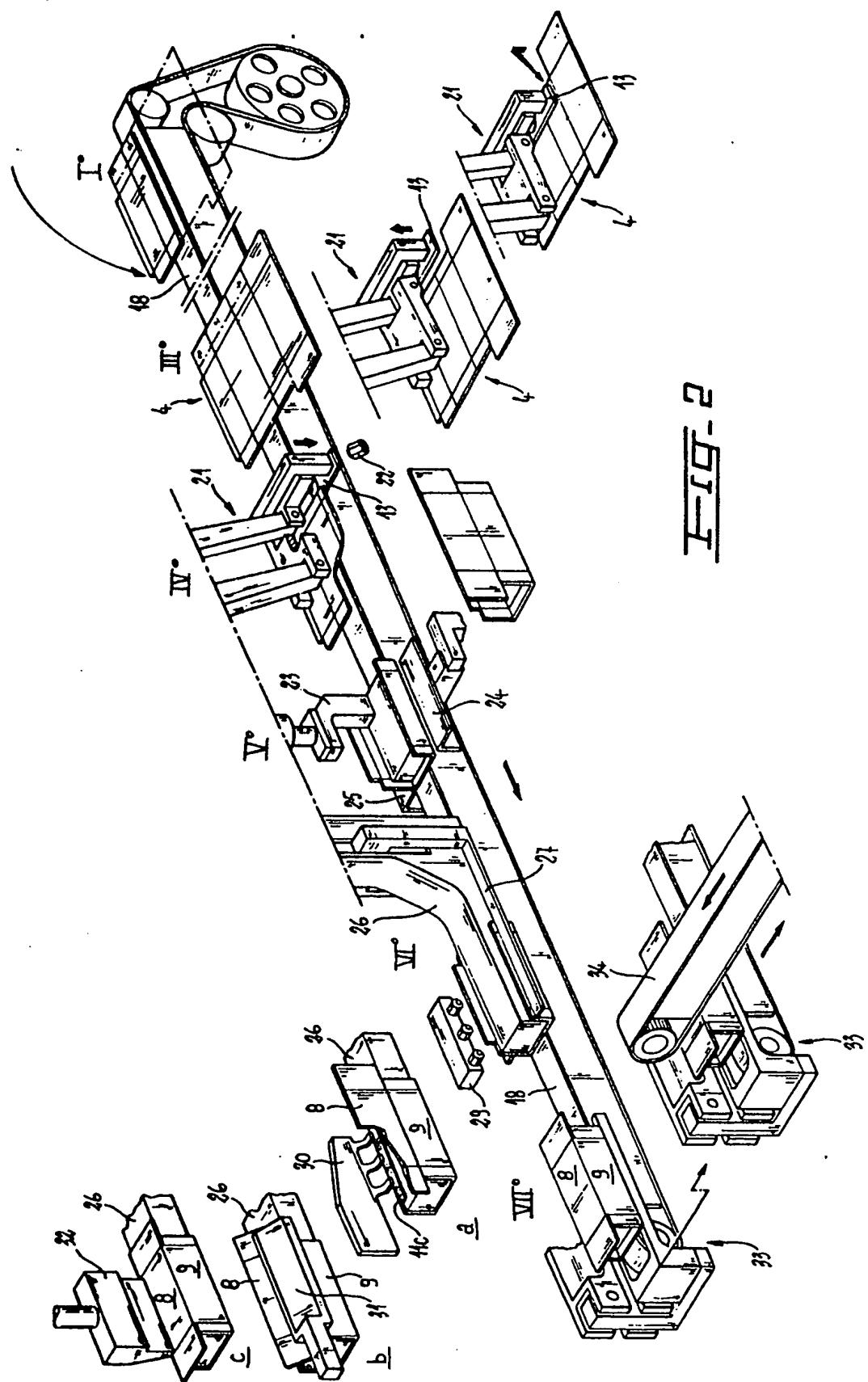
(54) Improvements in or relating to suction belt conveyors

(57) A conveyor for use in carrying a cardboard blank 4, or similar item, successively to a series of machine stations, comprises a toothed belt 18 arranged around a pair of toothed wheels to be driven by at least one of the wheels; the inner face of one run of the belt between the wheels being supported by an air extraction duct 37 the interior of which is connected to air extraction means; and the outer face of the belt having a series of spaced recesses there-along, each of said recesses along one run of the belt, communicating with the interior of the duct, so that a series of suction cups is formed along that run of the belt to retain said blanks in position on the conveyor.



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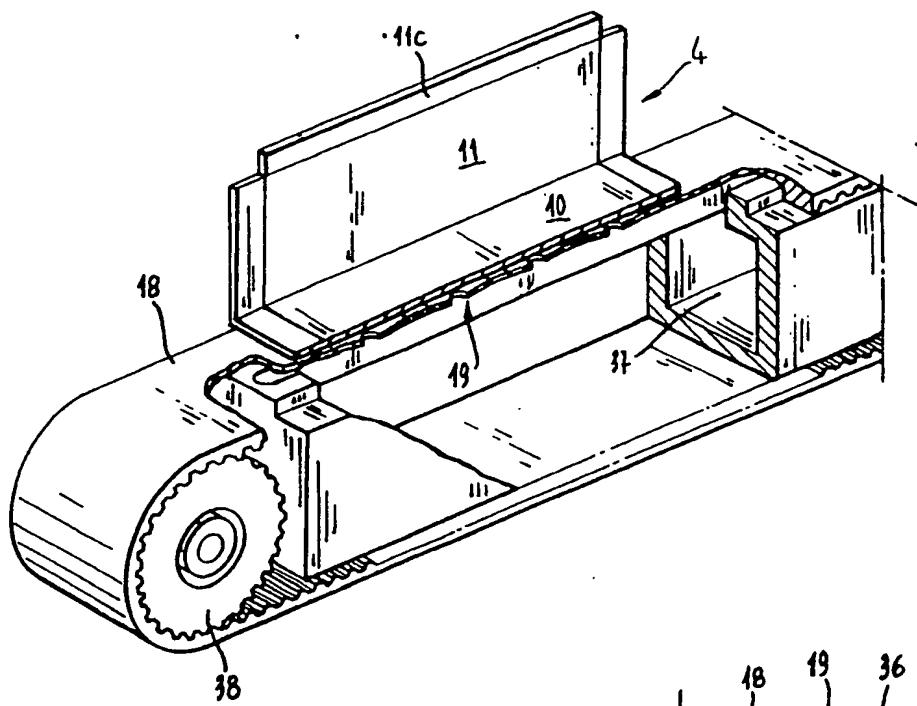


FIG. 3

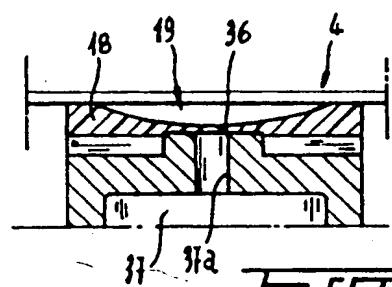


FIG. 5

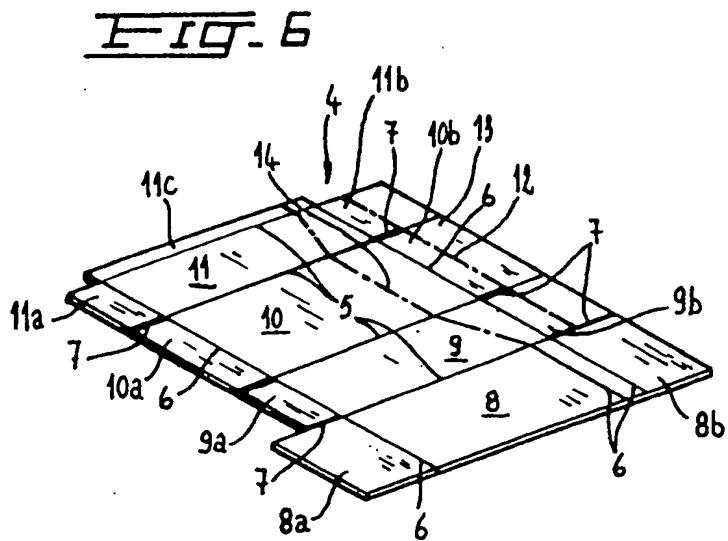
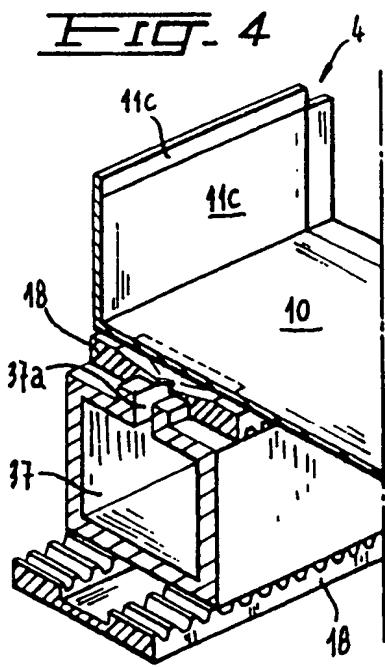


FIG. 6

"IMPROVEMENTS IN OR RELATING TO CONVEYORS"

The present invention relates to a production line arrangement, for use with a series of high-speed machines 5 for packaging products in general, particularly in boxes or cases of the hinged-lid type with a guarantee seal using flat blanks with multiple component parts.

The present invention relates particularly to a conveyor 10 arrangement for connecting on for use in high-speed machines in such an arrangement for packaging products in general, in hinged-lid boxes or cases, formed from flat blanks with multiple component parts, the arrangement comprising operationally independent modular machine units 15 interconnected in the overall arrangement in an interdependent manner, so as to accommodate variations in the box production procedures and/or the properties of the material to be packaged and the specific configuration of the flat blanks, by replacing one or more machine units in 20 the overall arrangement. An example of such a high-speed packaging machine unit that may be used with the arrangement of the invention, is that disclosed in Italian Patent Application 3687 A/89 in the name of the present applicants.

to convey the flat blanks with multiple component parts from which the boxes are formed, individually to a series of operating stations which may include means to establish their suitability for production as cases or boxes or
5 means by which they can be folded into an assembled or part assembled box.

Accordingly the present invention provides a conveyor for use in carrying a cardboard blank, or similar item,
10 successively to a series of machine stations, comprising a driven toothed belt arranged around a pair of toothed wheels; the inner face of one run of the belt between the wheels being supported by an air extraction duct the interior of which is connected to air extraction means; and
15 the outer face of the belt having a series of spaced recesses there-along each of said recesses along said one run of the belt communicating with the interior of the duct, so that a series of suction cups is formed along that run of the belt to retain said blanks in position on the
20 conveyor.

An advantage of the conveyor of the invention, lies in that it may be equipped at will with one or more operating stations designed to make it possible to produce cases or
25 boxes of any desired type, particularly of the hinged-lid type with a guarantee seal, which can be closed over a collar member in the box. Such collar member may form part of the flat blank constituting the box body and the lid

body of the box, so that by removing this member firstly from the flat blank and then re-applying it in a superimposed position on the blank.

5 In order to promote a fuller understanding of the above and other aspects of the present invention, an embodiment will now be described, by way of example only, with reference to the accompanying drawings in which

Fig.1 is a perspective view of a production line
10 embodying a conveyor of the invention, as seen from the top, from the viewpoint of the operator;

Fig.2 is a perspective diagrammatic view similar to Fig.1 of the production line with its various operating stages for the production, in tubular form, of part
15 assembled packaging cases or boxes;

Figs.3, 4 and 5 are perspective views and a cross-section of three details, on an enlarged scale, showing the conveyor of Figures 1 and 2; and

Fig.6 shows the structure of a blank with multiple
20 parts which can be used in the production line of Figs.1 and 2 for the production of part assembled cases or boxes.

As mentioned above, an object of the present invention is to provide a production line conveyor arrangement for
25 use with modular units designed to package products in general. A typical flat cardboard blank from which such units may assemble a box or case usually has, defined by longitudinal and transverse fold lines and notches, a

4.

plurality of panels and flaps designed to form the box body and the lid body, and may include separation lines for a separable portion designed to form the collar member and a guarantee seal for the lid body (see for instance the
5 Italian Patent Application 3577 A/87 in the name of the present applicants).

In the embodiment of the invention shown in the attached drawings, a production line is arranged with various
10 modular machine sections shown at 1, 2 and 3 (see Fig.1) including one as disclosed in Italian Patent Application 3687 A/89 by the present applicants. A flat cardboard blank with multiple component parts indicated generally at 4 (see Fig.6 in particular) is used to form a package. The
15 blank has lateral walls 8, 9, 10 and 11, closure flaps 8a, 8b; 9a, 9b; 10a, 10b and 11a, 11b and 11c, defined by longitudinal and traverse fold lines 5 and 6 respectively, and notches 7 and, as will be explained in detail below,
has separation lines 12 and 14 of which line 12 defines the
20 part intended to form a collar member 13 and line 14 forms a tear-off guarantee seal between the box body and the lid body.

A flat blank 4 of this type is supplied to the production
25 line structure of the present invention by the first machine 1, for instance as disclosed in the Italian Patent Application 3688 A/89 (co-pending UK Patent Application No..... in the name of the present applicants, to the

second machine so that a tubular part assembled box can be formed therefrom, and the box in this tubular form is transferred from the second machine 2 to the third machine 3 so that it can be filled with the product to be packaged, 5 and so that the box can be closed with a guarantee seal.

In accordance with the above-mentioned Italian Patent Application 3688 A/89, the blanks 4 stacked sideways in a store 15 of high storage capacity which is inclined downwards in a downstream direction, are firstly caused to advance in groups, under control, by a divider device designated overall by 16 so as to free them from the load of the main stacked column; and they are then taken from these groups in individual sequence by a suction cup take off device 17, and deposited in a flat horizontal position on the closed-loop conveyor 18 to which this application relates, which has a series of gripper means 19 (see Fig.5 in particular) explained in detail below, and which forms part of the second machine 2. This conveyor 18 is moved in an intermittent manner or in successive steps, (i.e. with a feed movement followed by a pause for the various machine or checking operations) to form the flat blanks 4 into boxes, wherein each pause corresponds to a operating station. The position in which these flat blanks 4 are deposited on the conveyor 18 is defined as station I. By means of an intermittent movement or successive steps of the conveyor 18, the blank 4 received at station I is caused to advance to station II (not shown) in which known

means (not shown) check whether it is whole or whether or not it is suitable to be formed into a box, or whether it should be rejected, and by known means (not shown) replaced by a suitable blank. By means of a further 5 intermittent movement or successive step the blank 4 is advanced to a non-operative station III, downstream of which and prior to station IV there is disposed a photocell device 20 (see Fig.1), arranged to check for the presence of a blank. By means of a further intermittent movement 10 or successive step, the blank 4 is conveyed from station III to station IV where, by means of an articulated lever device shown generally by 21 (see Fig.1) and following the detection of the presence of the blank 4 by the photocell device 20, the component part 13 of the blank designed to 15 form the collar of the box being produced, is separated along the separation line 12. The part 13 is then re-attached, as a result of relative movement between the collar portion 13 and the blank portion 4 and the spraying of glue on it by the gluing device 22 (see Fig.2) also 20 controlled by the photocell device 20, to the blank 4 with one edge along the separation edge 12. By means of a further intermittent movement or successive step the blank 4 provided in this way with the collar member 13, is advanced from station IV to station V where, by means of 25 counter-folding means 23 and folding means 24 and 25 (see Fig.2 in particular), actuated with an reciprocating vertical movement, the walls 9, 8 and 11 and the flap 11c with the associated flaps 9a, 9b; 8a, 8b and 11a, 11b are

folded vertically upwards about the respective longitudinal fold lines 5 (see Fig.2). Following a further intermittent movement or successive step, the folded blank 4 with a collar member 13 is supplied to station VI where its wall

5 10 and associated flaps 10a and 10b pass below a folding core member 26, with the walls 9, 8 and 11 and the flap 11c with the associated flaps 9a, 9b; 8a, 8b and 11a and 11b held in a vertical position, by guide means 27, against the longitudinal flanks of the folding core member 26 (see

10 Figs.1 and 2). At station VI (see Figs.1 and 2), following detection via a photocell device 28 of the presence of the blank 4 with the corresponding collar member 13, glue is sprayed by gluing means 29, also controlled by the photocell device 28, on the outer surface of the flap 11c;

15 and the latter, sprayed with glue in this way, is then folded onto the upper surface of the folding core means 26 (see position a of Fig.2), by a comb folding means 30. Then by means of the articulated lever folding device shown generally at 31 (see Fig.1), the panel or wall 8 is folded

20 against the upper surface of the folding core member 26 on to the glued packaging flap 11c (position b of station VI), and is held there by a pressure member 32 which has a vertical reciprocating movement (position c of station VI).

25 The blanks being and folded and assembled in this way into a tubular shape at station VI, are then supplied, by a further intermittent movement or successive step of the conveyor belt 18, to station VII, where, by means of a

device having a reciprocating vertical movement shown generally at 33 (see Figs. 1 and 2), it is transferred while being held by suction to a closed-loop conveyor 34 which in association with a conveyor 35 disposed vertically therebelow (see Fig. 1), forms part of the third machine unit 3, in which the boxes produced with a tubular shape in the second machine section 2 are filled with a product to be packaged, and the opposite ends or heads of the corresponding boxes or cases are closed with the guarantee seal.

Figures 3, 4 and 5 show the conveyor belt 18 in more detail. The belt 18 is a toothed belt passing around, and driven by at least one of, a pair of toothed wheels 38, and supported along the length of at least the upper run between the toothed wheels by an extraction duct 37. The inner surface of the belt is toothed to engage the wheels 38, and is formed with a centrally disposed groove which, along the upper run of the belt, engages and locates on a ridge formed along the top of the duct 37.

The belt 18 is formed with a series of spaced recesses 36 in its outer surface, each recess communicating, by way of an aperture in the bottom of the recess, with a longitudinal slot 37a in the locating ridge on the duct 37, so that each recess is in communication with the interior of the duct. Thus when air is drawn out of the duct 37 in known manner per se by suitable means (not shown), the

rescenses 36 form a series of suction cups 19 along the upper run of the belt, which will retain the blanks 4 in position on the belt as they are indexed along through the various stations I to VII. Suitable means (not shown) is 5 also provided to drive one or both of the toothed wheels 38 to index the belt in synchronisation with the other machine elements in known manner per se.

The recesses 36 of the suction cups 19 are generally 10 rectangular in shape at the surface of the belt, and arcuate in cross-section transverse to the belt.

In some applications (not shown) the suction cups 19 may be effective along both runs of the belt 18, with a guide 15 ridge and slot being provided along the bottom run also.

The description of the production line structure in question made with reference to the attached drawings is given solely by way of example and any modifications and 20 variants suggested by practice and use can be made thereto without departing from the scope of the following claims.

CLAIMS

1. A conveyor for use in carrying a cardboard blank, or similar item, successively to a series of machine stations, comprising a driven toothed belt arranged around a pair of toothed wheels; the inner face of one run of the belt between the wheels being supported by an air extraction duct the interior of which is connected to air extraction means; and the outer face of the belt having a series of spaced recesses there-along each of said recesses along said one run of the belt communicating with the interior of the duct, so that a series of suction cups is formed along that run of the belt to retain said blanks in position on the conveyor.
- 15 2. A conveyor as claimed in Claim 1, in which said recesses each extend substantially across the width of the belt.
- 20 3. A conveyor is claimed in Clam 1 or 2, in which said recesses are each of generally arcuate cross-section transverse to the belt.
- 25 4. A conveyor as claimed in Claim 1, 2 & 3, in which said recesses are each generally rectangular in shape at the surface of the belt.
5. A conveyor as claimed in any preceding Claim, in which said recesses each have an aperture at the bottom thereof

in communication with a longitudinal slot in said duct along at least said one run of the belt.

6. A conveyor as claimed in any preceding Claim, in which
5 the inner surface of said belt is formed with longitudinal
groove arranged to engage and locate on a corresponding
ridge on said duct along at least said one run of the belt.

7. A conveyor as claimed in Claim 6 as dependent upon
10 Claim 5, in which said slot is formed in said ridge.

8. A conveyor as claimed in Claim 6 or 7, in which said
groove and ridge are disposed generally centrally across
the width of the belt.

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9. A conveyor as claimed in any preceding Claim, in which
both runs of the belt are so supported by said duct with
said suction cups being formed along both runs of the belt.

20 10. A conveyor as claimed in any preceding Claim, in which
the belt is intermittently driven to index articles thereon
successively to said series of machine stations.

25 11. A conveyor for use in carrying a cardboard blank, or
similar item, successively to a series of machine stations,
substantially as herein described with reference to the
accompanying drawings.

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